DATA EVALUATION RECORD

LINALOOL

STUDY TYPE: Product Performance - 8100 Series
MRID 46259802

Prepared for
Biopesticides and Pollution Prevention Division
Office of Pesticide Programs
U.S. Environmental Protection Agency
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Prepared by
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Task Order No. 04-54

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DATA EVALUATION RECORD

EPA Secondary Reviewer:

STUDY TYPE:	Product Performance - Efficacy
MRID NO:	46259802
DP BARCODE NO:	DP
TEST MATERIAL:	Linalool
PROJECT NO:	Not given
SPONSOR:	BioSensory Inc. 322 Main Street Willimantic, CT 06226
TESTING FACILITY:	Not given
TITLE OF REPORT:	Product Performance Data for Conceal™ Candle
AUTHOR:	Amy Roberts
STUDY COMPLETED:	April 26, 2004
GOOD LABORATORY PRACTICE:	Not GLP Compliant
CONCLUSION:	Results from several field and laboratory studies indicate that linalool is effective as a spatial repellent to mosquitoes. Linalool is also the active ingredient in Mosquito Cognito® (EPA Reg. No. 70909-4).
CLASSIFICATION:	Acceptable

Summaries of several individual field and laboratory efficacy studies using linalool as a mosquito inhibitor are presented. Each study is summarized below.

Evaluation of the Efficacy of Linalool Candles as Spatial Repellents against Natural Populations of Mosquitoes. (McKnight, S. 2003, unpublished)

A field study was conducted in August 2003 to characterize the action of linalool candles as inhibitors of natural populations of mosquitoes in a deciduous woodlot in Connecticut, USA. Landing counts were taken from 4 human subjects rotated among 4 stations on each of 4 nights. Each station contained a different type of candle;
A) Fragrance A, 65% +enantiomer and 35% -enantiomer of linalool
B) Fragrance B, racemic linalool
C) OFF Citronella

D) unscented candle

The total number of mosquitoes collected each night ranged from 141 to 187. Landing counts for the 4 treatments differed significantly. Mean landing counts per person at positions with the four treatments were;
Fragrance A, 7.19
Fragrance B, 11.06
Citronella, 13.25
Tea Candle, 9.69
Fragrance A was the most effective inhibitor and both Fragrance A and Fragrance B were better inhibitors than Citronella.

Evaluation of the Efficacy of Linalool Candles as Spatial Repellents against Natural Populations of Mosquitoes. (McKnight, S. 2004, unpublished)
A second trial was conducted in Florida similar to the one in Connecticut except the tea candle was not tested. Instead, landing counts were recorded in an unprotected station. In Florida, the average number of mosquitoes that attacked test subjects per night was 38.0 for unprotected subjects, 22.3 for subjects protected by citronella, 20.5 for subjects protected by Fragrance B and 11.3 for subjects protected by Fragrance A+. Test subjects received 64% fewer mosquito landings at positions protected with Fragrance A+ (85%+ and 15%- enantiomers) compared to no treatment.

Olfactometric Evaluation of Spatial Repellents for Aedes aegypti. (Kline et al, J. Med. Entomol. 40(4) 463-467)
Responses of female *Aedes aegypti* to linalool, dehydrolinalool, diethyl-m-toluamide (DEET) and a human attractant consisting of a mixture of acetone with facial hair and skin were evaluated using a dual port olfactometer. Mosquitoes that approached a port were collected in a trap. Linalool inhibited the ability of mosquitoes to locate human attractant. Linalool affected mosquito behavior in several ways. First, linalool inhibited flight activation. That is, fewer mosquitoes took flight when human attractant was introduced at one port. Second, mosquitoes that did fly were less able to find the human-attractant baited ports. Third, the time required for mosquitoes to find either port was longer with linalool present than absent.

Laboratories tests of the Cognito devices against vector mosquitoes in the tropical environment. (Yap, 1999a, University of Saint Vector Control Research Unit, Malaysia, unpublished)
The efficacy of linalool emitted from a Mosquito Cognito dispenser in inhibiting female *Aedes aegypti* and *Aedes albopictus* was investigated using a baited double glass chamber. Exemplars of both species avoided the chamber that contained the Mosquito Cognito dispenser. Avoidance was up to 100% for *Aedes aegypti* and up to 88% for *Aedes albopictus*.

Field efficacy of Dragonfly Mosquito Cognito against indoor night-biting mosquitoes in living premises in the tropical environment. (Yap, 1999b, University of Saint Vector Control Research Unit, Malaysia, unpublished)
Indoor efficacy of linalool form Mosquito Cognito dispenser was evaluated in three trials conducted during successive weeks in houses in Ujung Bata, Malaysia. Biting and landing counts were determined using human subjects as bait. Linalool reduced biting and landing by 46.5%, 51.6% and 37.5% during the first, second and third trial, respectively.

In addition, two studies are cited which were previously submitted for EPA registration of Mosquito Cognito® (EPA Reg. No. 70909-4).

MRID No. 444458-03 Mosquito Cognito Summary of Field Observations of Linalool as an Inhibitor. (1997, Biosensory Insect Control Corporation)
Linalool inhibited the ability of mosquitoes to locate baited traps. Linalool reduced collection of mosquitoes attracted by heat plus CO_2 by 58.8% in one trial and by 57.4% in another. Linalool inhibited collection of mosquitoes attracted by heat plus CO_2 plus octenol by 82.8% in one trial and by 45.6% in another. Because traps baited with heat, CO_2 and octenol typically attract mosquitoes more strongly than do humans, linalool can be expected to be an effective inhibitor of the ability of mosquitoes to track and attack humans and other mammals.

MRID No. 445974-02 Mosquito Cognito studies conducted at Sarasota, Florida. (1998, Biosensory Insect Control Corporation)
In 1998, a study of the efficacy of linalool as an inhibitor of mosquito activity was conducted in Florida. Landings on a human in a linalool protected area were reduced by 35% and 68% during peak mosquito activity and by 73% when insects were less active. The mean reduction in landing counts was 53%. Because mosquitoes were swarming during peak activity, the higher inhibition during lower activity is expected to be more typical. More than 90% of mosquitoes collected in a nearby baited trap were *Culex nigripalpus*, a vector of St. Louis encephalitis.

Study Author's Conclusion
The study authors conclude from several field and laboratory studies that linalool is effective as a spatial repellent for mosquitoes.

Reviewer's Conclusion
We agree with the study author's conclusions.